

1.3 Answers to 1.2 Exercise

A-Level Pure Mathematics : Year 2 Differentiation IV

Answer 1

(i)

θ (in degrees)	0	15	30	45	60	75	90
$x = 3 \sin 2\theta^\circ$	0	1.5	2.6	3	2.6	1.5	0
$y = 6 \cos \theta^\circ - 3\sqrt{2} \sin^2 \theta^\circ$	6	5.5	4.1	2.1	-0.2	-2.4	-4.2

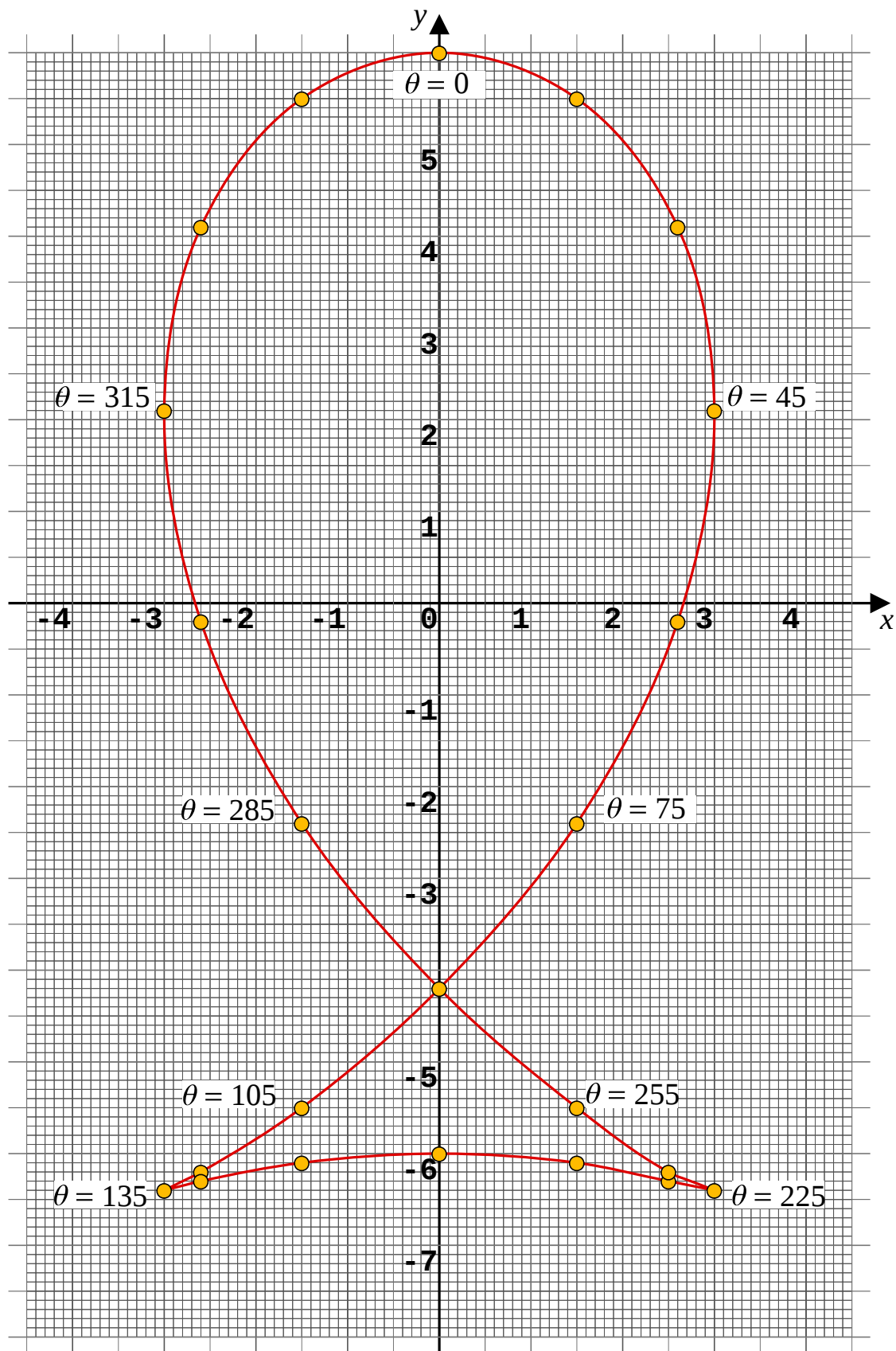
θ (in degrees)	105	120	135	150	165	180
$x = 3 \sin 2\theta^\circ$	-1.5	-2.6	-3	-2.6	-1.5	0
$y = 6 \cos \theta^\circ - 3\sqrt{2} \sin^2 \theta^\circ$	-5.5	-6.2	-6.4	-6.3	-6.1	-6

θ (in degrees)	195	210	225	240	255	270
$x = 3 \sin 2\theta^\circ$	1.5	2.6	3	2.6	1.5	0
$y = 6 \cos \theta^\circ - 3\sqrt{2} \sin^2 \theta^\circ$	-6.1	-6.3	-6.4	-6.2	-5.5	-4.2

θ (in degrees)	285	300	315	330	345	360
$x = 3 \sin 2\theta^\circ$	-1.5	-2.6	-3	-2.6	-1.5	0
$y = 6 \cos \theta^\circ - 3\sqrt{2} \sin^2 \theta^\circ$	-2.4	-0.2	2.1	4.1	5.5	6

[10 marks]

(ii)



[7 marks]

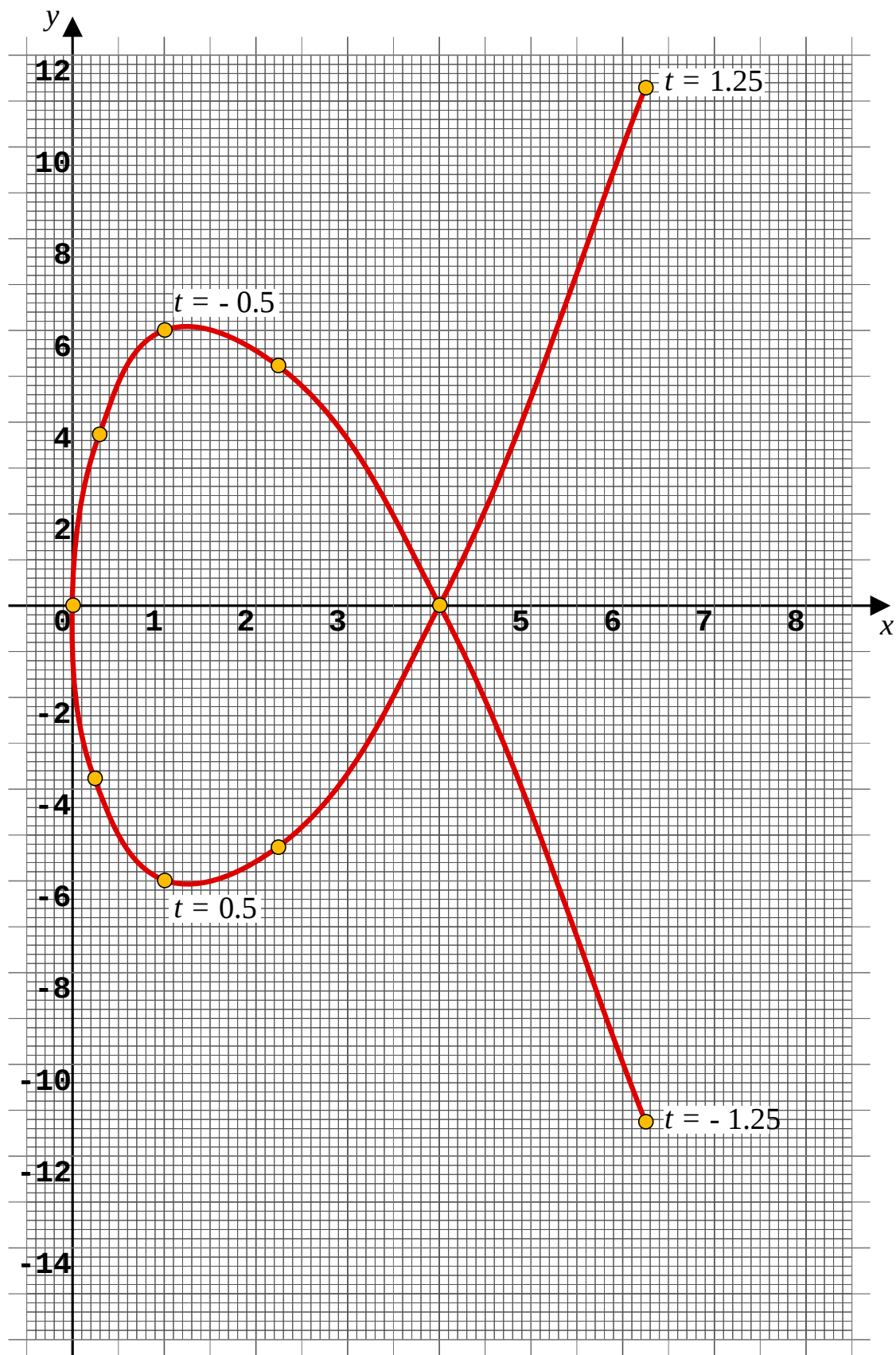
Answer 2**(i)**

t	-1.25	-1	-0.75	-0.5	-0.25
$x = 4t^2$	6.25	4	2.25	1	0.25
$y = 16t(t^2 - 1)$	-11.25	0	5.25	6	3.75

t	0	0.25	0.5	0.75	1	1.25
$x = 4t^2$	0	0.25	1	2.25	4	6.25
$y = 16t(t^2 - 1)$	0	-3.75	-6	-5.25	0	11.25

[8 marks]

(ii)



[7 marks]

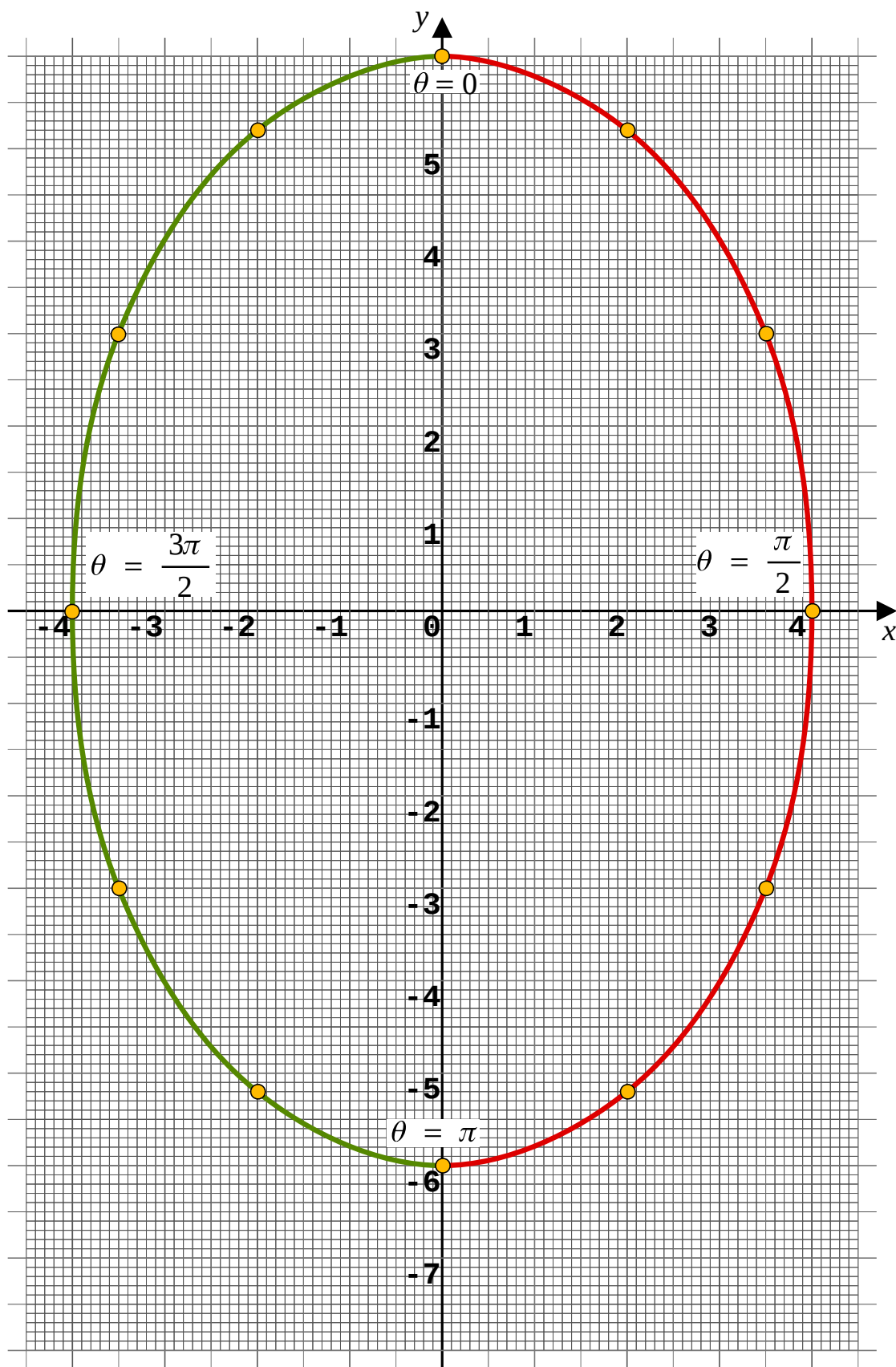
Answer 3**(i)**

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π
$x = 4 \sin \theta$	0	2	3.5	4	3.5	2	0
$y = 6 \cos \theta$	6	5.2	3	0	-3	-5.2	-6

[6 marks]**(ii)** See the graph on the following page, red curve.**[4 marks]****(iii)** See the graph on the following page, green curve.**[3 marks]****(iv)** The same ellipse will be traced out because,

$$4 \sin (\theta + 2\pi) = 4 \sin \theta \quad \text{and} \quad 6 \cos (\theta + 2\pi) = 6 \cos \theta$$

[2 marks]



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Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com